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at the same time men who formerly did distinguished scientific work—form part of the minority. Indeed, a large percentage of this minority consists of presidents, directors, deans and other university officials.¹³ Whether this should be interpreted as that much in favor of the present system, or that much more against it, may be left an open question.

A considerable number of professors at Harvard favor the existing system, but their preference applies to their own situation, where the administrative autocracy is tempered. Of 19 replies from Wisconsin and Illinois, eight favor a limited autocracy, but they have in mind their system, which is not the same as that of the private universities. Probably they would in any case prefer the methods of President Van Hise and President James to those of President Draper. Those who want a strong executive responsible to the people of the state have been classed in the group favoring a limited autocracy. Thus the two replies from Columbia which are placed in this group are from men who do not trust faculty control, though, as I happen to know, they are by no means satisfied with the existing situation. If these two cases are omitted, we find that of 70 replies from Columbia, Pennsylvania, Cornell, Johns Hopkins and Chicago—these are the institutions which I had especially in mind in my proposals—only one (an executive officer) favors the existing system, eleven favor greater faculty control, and 58 a

complete change which would make the administration responsible to the faculties. This is surely a condition which foretells reform or bankruptcy.

J. McKEEN CATTELL

(To be continued)

ABBOTT LAWRENCE ROTCH¹

ABBOTT LAWRENCE ROTCH was born in Boston, January 6, 1861, the son of Benjamin Smith and Anna Bigelow (Lawrence) Rotch. He was graduated from the Massachusetts Institute of Technology (S.B.) in 1884. In 1891 Harvard recognized the importance of the work which he had already accomplished by bestowing upon him the honorary degree of A.M. From 1888 to 1891, and again from 1902 to 1906, he held the appointment of assistant in meteorology at Harvard, a position which involved no teaching and in which no salary was paid. In 1906 he was appointed professor of meteorology, an honor which he prized very highly, and which gave him the position on the teaching staff of the university to which he was in every way fully entitled. He was the first professor of meteorology who has occupied that position at Harvard, and he served in this professorship without pay. In the year 1908–09, at the request of the department of geology and geography, he generously put the splendid instrumental equipment and library of Blue Hill Observatory at the service of the university, by offering a research course ("Geology 20f") to students who were competent to carry on investigations in advanced meteorology. This action on the part of Professor Rotch gave Harvard a position wholly unique among the universities of the United States. It brought about a close affiliation, for purposes of instruction and of research, between the university and one of the best-equipped meteorological observatories in the world. To his work as instructor Professor Rotch gladly gave of his time and of his means. He fully realized the unusual ad-

¹³ Eighteen of the replies are from men who formerly held academic positions but are now connected with research institutions, the government service, etc., or who while holding professorships are principally engaged in other work. These replies show about the same distribution as the others, three in the first group, four in the second and eleven in the third. They are classed under the institutions with which the men are or were connected. Two replies from those previously connected with universities as teachers, but somewhat incidentally, have been omitted. They both belong to the third group.

¹ An appreciation of Professor A. Lawrence Rotch, based on the same material, appears also in the *Harvard Graduates' Magazine*.—R. DeC. W.

vantages which he was thus enabled to offer those students who were devoting themselves to the science of meteorology, and the experience of the men who had the privilege of his advice and help in the work at Blue Hill shows clearly how much they profited by this opportunity. Only a short time before his death he had expressed the wish to bring about a still closer connection, for purposes of instruction, between the university and Blue Hill Observatory. He thus showed his appreciation of the importance of the new field of work which he had undertaken.

While thus planning still further usefulness for his observatory; in the midst of a life singularly active; with an ever-widening sphere of scientific influence and a constantly increasing importance of his contributions to meteorology, Professor Rotch died suddenly in Boston on April 7, 1912, in the fifty-second year of his age. His wife, who was Miss Margaret Randolph Anderson, of Savannah, Ga., and three children survive him.

Professor Rotch early developed that absorbing interest in meteorology which caused him to devote his life to the advancement of that science. Possessed of large means, he preferred to work persistently, and not infrequently to undergo discomfort and hardship in his chosen field of research, rather than to live a life of ease. Realizing the need of an institution which could be devoted to the collection of meteorological observations, and to meteorological research, free from any entanglements, he established, in 1885, Blue Hill Observatory. This was first occupied by Mr. Rotch and his observer, Mr. W. P. Gerrish, on February 1, 1885. This observatory he not only equipped and maintained until his death, but he made provision in his will for having the work there carried on without a break. Blue Hill Observatory is to-day one of the few private meteorological observatories in the world, and there is not one which is better equipped. In fact, it is probably safe to say that there is no private scientific establishment which is better known for the high standard of its work. The Blue Hill Observatory was, with the exception of

the municipal meteorological station in New York, the first in this country to be equipped with self-recording instruments, and it is to-day one of the comparatively few in the world where nearly every meteorological element is continuously recorded. Beginning with 1886, hourly values have been printed. Professor Rotch took a splendid pride in his observatory, and in its equipment, and his library, to which he devoted constant care, was one of the most complete and valuable in the world.

Professor Rotch early realized that the advance of meteorology must come through a study of the free air, and with keen and prophetic judgment he planned and carried out the remarkable series of investigations which have made Blue Hill so famous. He secured assistants who were well fitted to carry out the researches which he planned and supervised. He thus showed his ability to judge the value of men, as well as his capacity to organize the work for them to do. Mr. H. H. Clayton became a member of the Observatory staff in 1886, and served, as observer and meteorologist, with some interruptions, for twenty-three years. His work brought distinction to himself and to the observatory. Mr. S. P. Ferguson joined the staff in 1887, and remained there until 1910. Many new instruments were devised by him, and perfected with care and success. Mr. A. E. Sweetland died after eight years of service and was succeeded, in 1903, by Mr. L. A. Wells, who is now observer-in-charge, with Mr. A. H. Palmer as research-assistant. Year after year the Blue Hill publications have contained results of far-reaching importance. It is not an exaggeration to say that much of the recent rapid advance of meteorological science is due to the pioneer work which was done at Blue Hill.

Under an arrangement entered into between Blue Hill Observatory and the Astronomical Observatory of Harvard College, Professor Rotch was, for nearly twenty-five years, closely associated with the latter institution. All of the observations made at Blue Hill were published in the *Annals* of the Harvard Observatory, and fill eight quarto volumes.

The international form of publication, and metric units, were first used in the United States in the publications of the Blue Hill Observatory.

It was one of Professor Rotch's most striking characteristics that he never neglected any opportunity which might help him to keep his observatory not only abreast of the times but ahead of the times. He thought nothing of the time and the expense of taking a trip to Europe in order to attend some scientific meeting, meteorological or aeronautical, if he believed, as he most firmly did, that he might by so doing gain inspiration and new ideas. Few scientific men are so regular in their attendance at congresses and meetings; few contribute so much that is new or gain as much inspiration as he did at such gatherings. It was not the blind following of the dictates of his New England conscience that prompted him to be so regular in his meetings with his scientific colleagues. His motive was a higher one than that. It was his absorbing desire to advance his science by every means within his power. The list of scientific bodies of which he was a member was a long one, but every one of them gained much from his membership and from his presence at its meetings. He was regular in his attendance; always ready to contribute papers; always modest in his estimate of the importance of his own work; always generous in his appreciation of the work of others; always ready with a word of sympathy, or encouragement, or fellowship.

The productivity of Blue Hill Observatory has been remarkable, especially when it is remembered that this activity was the result of the support and inspiration of one man. The study of cloud heights, velocities, movements and methods of formation at Blue Hill was one of the most complete investigations of the kind ever undertaken. The first series of measurements in America of the height and velocity of clouds, by trigonometrical and other methods, was made at Blue Hill in 1890-91. These measurements were repeated in 1896-97, as a part of an international system.

It was at Blue Hill that the modern methods of sounding the air by means of self-recording instruments lifted by kites were first developed and effectively put into practise (1894), methods which have now been adopted by meteorological services and scientific expeditions in all parts of the world. The use of cellular kites flown with steel wire and controlled by a power windlass originated at Blue Hill. Grants for carrying on this kite work were obtained from the Hodgkins Fund.

It was Rotch who, in 1901, during a voyage across the Atlantic, first obtained meteorological observations by means of kites flown from the deck of a moving steamer, thus indicating the feasibility of a new way of securing information concerning the conditions of the free air over oceans and lakes. It was Rotch who, in 1904, secured the first meteorological observations by means of sounding balloons from heights of 5 to 10 miles over the American continent, and who, in 1909, made the first trigonometrical measurements of the flight of pilot balloons in the United States. In 1905-06 he joined his colleague, Teisserenc de Bort, in fitting out and taking part in an expedition to explore the tropical atmosphere over the Atlantic Ocean by means of kites and pilot balloons, an undertaking which resulted in the collection of important data regarding the temperatures and movements of the upper air. But Rotch was not content with merely sending up kites and balloons. His enthusiasm in the study of the free air, and his desire to visit the mountain observatories of the world, led him to become a mountain climber of no mean ability. He ascended to the summit of Mont Blanc at least five times, and in South America and elsewhere he himself made meteorological observations at considerable altitudes on mountains, and carefully observed the physiological effects of the diminished pressure. He also took part in several balloon ascents, and was a member of more than one solar eclipse expedition. His studies of eclipse meteorology are among the most complete which have been made. Among his many contributions to the advancement of meteorology must also be mentioned his in-

vention of an instrument for determining the true direction and velocity of the wind at sea.

Professor Rotch was naturally intensely interested in the recent rapid development of aeronautics. His earlier training at the Massachusetts Institute of Technology, and his untiring zeal in the exploration of the upper air, combined to give him this interest. He turned his attention largely in that direction of late years. It was characteristic of him that, not content with the mere collection of data, and with investigations of theoretical interest, he always strove to make these results of practical use. Thus, soon after the establishment of his observatory, the issue of local weather forecasts was begun, and one of the last things which he published (in association with Mr. A. H. Palmer) was a set of "Charts of the Atmosphere for Aeronauts" confined to meteorology, and show most embodying many of the results of observations made at Blue Hill in a practical form for the use of airmen.

Professor Rotch's list of published papers and books comprises 183 titles. These cover a wide range of subjects, by no means strictly confined to meteorology, and show most emphatically how varied were their author's interests; how extended was his reading; how alert and progressive he was in all he undertook. These 183 titles in themselves furnish a satisfactory outline of the development of meteorological science during the past 25 years. In addition to the "Charts of the Atmosphere" just referred to, he published two other books, "Sounding the Ocean of Air" (1900) and "The Conquest of the Air" (1909).

Professor Rotch gave his support freely to a large number of scientific societies and undertakings. He was one of the pioneer and most enthusiastic members of the New England Meteorological Society. He was, for more than ten years (1886-96), one of the associate editors and one of the mainstays of the *American Meteorological Journal*, which did a unique work for American meteorology. He was a member of the Astronomical and Astro-

physical Society of America; a fellow and of late years librarian of the American Academy of Arts and Sciences; a member and trustee of the Boston Society of Natural History; a member of the American Philosophical Society, of the Physical Society of London, of the International Solar Commission, of the International Commission for Scientific Aeronautics, of the International Meteorological Committee; fellow of the Royal Meteorological Society (London); member of the Société Météorologique de France, of the Deutsche Meteorologische Gesellschaft, of the Oesterreichische Gesellschaft für Meteorologie and of many other societies.

He was lecturer at the Lowell Institute, in Boston, in 1891, and again in 1898. He was a member of the International Jury of Awards at the Paris Exposition (1889), and was then made a Chevalier of the Legion of Honor. He received the Prussian Orders of the Crown (1902) and Réd Eagle (1905) of the Third Class in recognition of his services in advancing the knowledge of the atmosphere. The latest evidence of the high regard in which his scientific work was held abroad was his selection, by the French ministry of public instruction, as exchange professor at the Sorbonne for the year 1912-13. The official letter announcing this selection arrived in this country within a very few days after Professor Rotch's death.

He was a pioneer in a new science; an investigator, whose name is known wherever meteorological work is done; a loyal teacher who served without salary; a generous benefactor, who left to the university an enduring monument of his enthusiasm and untiring devotion to the science which he himself did so much to advance. His life and labor have been an inspiration to his scientific colleagues everywhere, but especially to those who were most closely associated with him in the work of his observatory, and in the department of the university of whose staff he was a valued member.

ROBERT DE C. WARD

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